MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2015/2016

BDS2074 – MANAGEMENT DECISION SCIENCE

(All sections / Groups)

11 MARCH 2016
9.00 a.m – 11.00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **FOUR (4)** printed pages excluding cover page.
2. Answer **ALL FOUR (4)** questions.
3. Please write all your answers in the Answer Booklet provided.

QUESTION 1 (25 MARKS)

Advanced Chemical Industries is a pharmaceutical company that produces three types of acetaminophen based pill: Fast Relief (X_1), Ultra Relief (X_2) and Soluble Relief (X_3). Each Fast Relief, Ultra Relief and Soluble Relief pill earns a profit RM 0.50, RM 0.60 and RM 1.00, respectively. All the pills contain three active ingredients: paracetamol, caffeine and opioid. A standard Fast Relief pill contains 2 mg of paracetamol, 3 mg of caffeine and 2 mg of opioid. A standard Ultra Relief pill contains 4 mg of paracetamol, 5 mg of caffeine and 2 mg of opioid. A standard Soluble Relief pill contains 3 mg of paracetamol, 4 mg of caffeine and 4 mg of opioid. There are total of 600 g of paracetamol, 900 g of caffeine and 500 g of opioid available for the daily production of pills (Note: 1 g is equal to 1000 mg). The firm's manager would like to produce the type of pills that can maximize the profit.

(a) Formulate the above problem as a Linear Programming Model.

(5 marks)

(b) Set up the initial simplex tableau by including the necessary slack variables.

(6 marks)

(c) The optimal tableau for the above problem is given below, where S_1, S_2 and S_3 are the slack variables for paracetamol, caffeine, and opioid respectively.

C_j →		0.50	0.60	1	0	0	0	
↓	Solution Mix	X_1	X_2	X_3	S_1	S_2	S_3	Quantity
0.60	X_2	0.20	1	0	0.4	0	-0.3	90 000
0	S_2	0.40	0	0	-1.2	1	-0.1	130 000
1	X_3	0.40	0	1	-0.2	0	0.4	80 000
	Z_j	0.52	0.60	1	0.04	0	0.22	***P***
	$C_j - Z_j$	-0.02	0	0	-0.04	0	-0.22	

(i) Find the value of ***P***.

(2 marks)

(ii) How many units of each model should be produced in order to obtain maximum revenue? What is the maximum revenue?

(4 marks)

(iii) What would the optimal profit be if the ingredients of opioid increased by 30 mg?

(3 marks)

(iv) State the status of each resource whether it is a binding or non-binding resource. Determine how many units of each resource are unused?

(5 marks)

Continued...

QUESTION 2 (25 MARKS)

(a) A certain firm has four different factories, whose finished products must be transported to three different warehouses. The vice president would like to ensure that the transportation cost is minimized. Transportation costs (RM) for the factories, warehouses, demand and supply are shown below:

Factory	Warehouse			Supply
	A	B	C	
1	12	10	6	500
2	4	15	3	700
3	9	7	5	400
4	11	8	6	700
Demand	900	600	800	

Obtain an initial feasible solution using the Vogel's Approximately Method. Then apply the Stepping Stone Method to find the least-cost distribution system.

(15 marks)

(b) Two projects must be completed and each of four employees will be assigned to work on these projects. The table below presents an estimate of the cost (RM) that each employee would incur if working on the respective projects. What is the minimum cost of workers assigned to the project?

Employee	Project	
	X	Y
Alice	5	6
Brad	4	2
Charlie	3	6
David	9	7

(10 marks)

Continued...

QUESTION 3 (25 MARKS)

Aisyah Electric is a company that provides all kinds of electrical works for commercial and housing area. Currently, the company has been awarded a new electrical wiring project. A list of activities and their shortest, most likely and longest times in days are given in the following table:

Activity	*Immediate Predecessors*	*Duration (Days)*		
		Shortest	*Most Likely*	*Longest*
A	-	4	6	8
B	-	2	4	6
C	-	1	2	3
D	C	6	7	8
E	B,D	2	4	6
F	A,E	6	10	14
G	A,E	1	2	3
H	F	3	6	9
I	G	10	11	12
J	C	14	16	18
K	H,I	6	8	10

(a) Determine the expected duration and variance for each activity.

(5 marks)

(b) Represent the design involved in the form of an appropriate network of activities.

(3 marks)

(c) Identify the critical path and the expected completion time of the project. Determine the earliest start time, latest start time, earliest finish time, latest finish time and slack time.

(17 marks)

Continued...

QUESTION 4 (25 MARKS)

A manufacturer needs to determine the optimum production mix of the various television models. The manufacturer either continues to use the original product mix, A1 or use a new mix based, A2. Naturally, action A1 is ideal if the customer's demand is higher and action A2 will also be ideal if the demand is on medium level. The following table provides the payoff value:

Alternative	State of Nature		
	High Demand (RM)	Medium Demand (RM)	Low Demand (RM)
Original Mix (A1)	400 000	295 500	183 725
New Mix (A2)	372 000	350 000	280 008
Probabilities	0.4	0.3	0.3

(a) What decision would the manufacturer make if they wanted to minimize the maximum opportunity loss?

(6 marks)

(b) Determine the best strategy using Expected Monetary Value (EMV).

(5 marks)

(c) Select the best alternative based on Maximax decision.

(4 marks)

(d) Determine the best alternative if they wanted to minimize their expected loss.

(6 marks)

(e) Find the best alternative through Maximin criterion.

(4 marks)

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